

**REMARKS**

Applicant requests favorable reconsideration of this application in view of the foregoing amendments and the following remarks. Claims 1-97 were pending in the application and were rejected in the Office Action. Claims 2, 17, 34, 63, 71, 75, 80, 83, and 89 have been cancelled without prejudice or disclaimer. Claims 1, 3, 4, 22, 35, 36, 52, 62, 64, 76-79, 81, 84-88, and 90-93 have been amended and new claims 98-100 have been added. No new matter has been added.

Claim 1 has been amended to clarify that the method relates to a passive device. A similar amendment has been made to the corresponding apparatus claim 62. Accordingly, dependent claim 75 has been deleted and a new independent claim 98 to the active device has been included. Independent claims 22, 52 and 93 are also limited to an active device. All five previously pending independent claims include the feature of applying a correction for the dispersive nature of the bending waves and thus the corresponding dependent claims to these features have been deleted.

**1. Formalistic Objections and Rejections****a. Objection to the Specification**

The Examiner's objection to page 17, line 13 of the specification is not understood. The sentence reads well as it stands. Accordingly, the objection should be withdrawn.

With respect to the Examiner's objection to the specification for including reference characters not present in Figure 10d, proposed amendments to Figure 10d are presented in the Proposed Changes to the Drawings concurrently filed herewith. In anticipation of the Examiner's approval of these minor amendments, Formal Drawings incorporating these changes are also being filed concurrently herewith. Accordingly, the objection should be withdrawn.

**b. Rejection of Claims 27-30, 64, 65, 71, 76, 80-83, and 89 under 35 U.S.C. § 112, ¶ 1**

The Examiner rejected claims 27-30, 64, 65, 71, 76, 80-83, and 89 under 35 U.S.C. § 112, ¶ 1 "as containing subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention." As claims 71, 80, 83, and 89 have been cancelled without prejudice or disclaimer, the rejection is treated with respect to claims 27-

30, 64, 65, 76, and 81-82. For the following reasons, Applicant respectfully traverses this rejection.

Each of these claims was an originally filed claim and, therefore, constitutes its own support thereby precluding a rejection thereof under 35 U.S.C. § 112, ¶ 1. *See* M.P.E.P. § 2163(I) (stating “It is now well accepted that a satisfactory description may be in the claims or any other portion of the originally filed specification.” *Id.*); M.P.E.P. § 2163(I)(A) (stating: “There is a strong presumption that an adequate written description of the claimed invention is present when the application is filed.”); *In re Koller*, 613 F.2d 819, 204 U.S.P.Q. 702 (C.C.P.A. 1980)); *In re Wertheim*, 541 F.2d 257, 191 U.S.P.Q. 90 (C.C.P.A. 1976). Accordingly, for this reason alone the rejection should be withdrawn.

In addition, each of these claims is fully supported by the description. Specifically, with respect to each of the claims rejected under § 112, ¶ 1, support may be found for: (a) claims 27-30 at p. 13, line 19 – p. 14, line 6; (b) claim 64 and 65 at p. 19, line 16 – p. 20, line 3; (c) claim 71 at p. 4, line 22 – p. 5, line 8; (d) claim 76 at p. 10, lines 4-10; (e) claim 80 at p. 17, line 13 – p. 18, line 2; (f) claims 81-83 at p. 19, line 16 – p. 20, line 3; and (f) claim 89 at p. 4, line 22 – p. 5, line 8.

However, to the extent the Examiner may have intended to make this rejection under 35 U.S.C. §, ¶ 2, such a rejection also would have been improper for the following reasons. With respect to claims 27-30, which relate to the generation of bending wave signals which are not acoustically obvious, one skilled in the art would realize such bending wave signals are achieved simply by application of the appropriate signal to the emitting transducer. Accordingly, no undue experimentation would be required.

With respect to claims 64 and 81, which refer to a display screen that is itself used as the plate that supports bending waves (so that no additional cover plate is required), one skilled in the art would realize that there are a variety of ways that this may be achieved. For example, the display screen may be a typical LCD display that is comprised of two glass plates with a liquid crystal sandwiched in-between, whereby the whole screen can support bending waves. Alternatively, with the advent of light emitting polymers, these will ultimately be printed onto a plate (*e.g.*, glass or plastic) forming a solid plate that is the display and which supports bending waves. Accordingly, no undue experimentation would be required.

With respect to claims 65 and 82, which simply state that liquid crystals may be used as sensing transducers (as they will produce a voltage in response to a mechanical vibration), such a scheme may be implemented by one skilled in the art based on the information disclosed in the application and common general knowledge such as that disclosed in the prior art previously submitted and being submitted concurrently herewith (*see, e.g.*, the Kim and Patel article). Accordingly, no undue experimentation would be required.

With respect to claim 76, the claim has been amended to clarify that the measured bending wave signal is compared to a reference signal before the contact is made. Accordingly, as amended, the claim fully satisfies the requirements of § 112.

**c. Rejection of Claims 10, 11, 17, 42, 43, 56, 57, 61, and 63  
under 35 U.S.C. § 112, ¶ 2**

The Examiner rejected claims 10, 11, 17, 42, 43, 56, 57, 61, and 63 under 35 U.S.C. § 112, ¶ 2 as being indefinite. As claims 17 and 63 have been cancelled without prejudice or disclaimer, the rejection is treated with respect to claims 10, 11, 42, 43, 56, 57, and 61. For the following reasons, Applicant respectfully traverses this rejection.

With respect to claims 10, 11, 42, 43, 56, and 57, the Examiner rejected each claim for reciting “additional information” without providing specifics as to what constitutes the “additional information.” However, the specification provides clear examples of what may constitute “additional information.” *See* p. 6, line 16 – p. 8, line 21. For example, the “additional information” may be (but is not limited to): (a) a profile of the impulse shape for contact in a single location; (b) a profile of pressure versus time for a continuous trace contact; and/or (c) a signal which is characteristic of a person’s signature based on the speed and pressure during the contact. Accordingly, in light of the teaching in the specification of the type of information satisfying the “additional information” limitation recited in claims 10, 42, and 56 (and in claims 11, 43, and 57 through their dependency thereon, respectively), Applicant submits that claims 10, 11, 42, 43, 56, and 57 fully satisfy the requirements of § 112, ¶ 2 and, therefore, the rejection thereof should be withdrawn.

With respect to the rejection of claim 61, Applicant notes that claim 52 (from which claim 61 depends) states that bending wave vibration is *generated* in the member from one location and that the changed bending wave vibration is *measured* in the member *at two locations*. Accordingly, contrary to the Examiner’s assertion, there is no contradiction with respect to claim 61, which states that the changed bending wave vibration is measured at two

edges of the member. Therefore, as the rejection of claim 61 under § 112, ¶ 2 was improper, Applicant earnestly solicits a withdrawal of the rejection.

## **2. Prior Art Rejections**

Before turning to the merits of these rejections, Applicant notes that pending dependent claims 10, 11, 27-30, 42, 43, 56, 57, 61, 64, 65, 76, 81, and 82 were not rejected in light of any prior art reference or combination of references. Rather, each of these claims was rejected only under 35 U.S.C. § 112, ¶¶ 1, 2. Accordingly, as the § 112 concerns have been fully resolved by way of this Amendment (as previously discussed in detail), Applicant asserts that each of claims 10, 11, 27-30, 42, 43, 56, 57, 61, 64, 65 should be in condition for allowance; as claims 76, 81, and 82 have been amended to depend from new claim 98, the same automatic presumption does not apply thereto.

### **a. Rejection of Claims 1, 7-9, 20, 22-26, 32, 39-41, 50, 52-55, 62, 66, 69, 75, 77-79, 84, 87, 93-95, and 97 under 35 U.S.C. § 102(b)**

The Examiner rejected claims 1, 7-9, 20, 23-26, 32, 39, 40, 41, 50, 52, 53-55, 62, 66, 69, 75, 77-79, 84, 87, 93-95, and 97 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,329,070 (“Knowles”). Preliminarily, although the Examiner did not include independent claim 22 among the listed rejected claims, Applicant notes that: (a) the Examiner did address claim 22 in stating the reasons supporting the claim rejections; and (b) the rejection of claims 23-26 (which depend from claim 22) under § 102(b) implies that the Examiner intended to include claim 22 in this rejection. Accordingly, Applicant assumes this rejection was also made to claim 22.

Applicant also notes that the rejection of claim 32 is internally inconsistent with the rejection thereof under 35 U.S.C. § 103(a) as being obvious when considering Knowles and WO 97/09847 (“Azima”) in view of U.S. Patent No. 5,986,224 (“Kent”) (discussed in § 2(l)). In the rejection of claim 32 under § 103(a), the Examiner stated that the combination of Knowles and Azima fails to teach each limitation of claim 32 (“Knowles and Azima do not teach about the processing step of isolating undesired signals from the changed bending wave signal with a reference signal to identify when contact [is] made.”). Accordingly, Applicant assumes that the Examiner intended to reject claim 32 under § 103(a) and that its inclusion herein was inadvertent. Therefore, the rejection of claim 32 will not be addressed with respect to anticipation by Knowles under § 102(b).

Finally, as claim 75 has been cancelled without prejudice or disclaimer and as claims 77-79, 84, and 87 have been amended to depend from new claim 98, this rejection of these claims is now moot and, therefore, will also not be addressed.

**i. Claims 1, 7-9, and 20**

Knowles teaches that historically Lamb (flexural) waves were thought unacceptable for touch-screens because of their dispersive nature, and that shear waves were thought unacceptable because of the small amount of energy absorbed when a touch-screen is contacted. *See* col. 3, line 67 – col. 4, line 20. The invention described in Knowles departed from this conventional thinking by making use of shear waves in a time of flight analysis. *See, e.g.*, col. 4, line 25- col. 5, line 31.

Knowles, however, did not use flexural waves, including dispersive waves. Rather, Knowles described flexural waves (*i.e.*, anti-symmetric Lamb waves<sup>1</sup>) as “spurious” and proposed number of techniques to eliminate or “suppress” them. *See* Fig. 13; col. 1, lines 15-17; col. 5, lines 32-34; col. 13, line 43 – col. 15, line 41; claims 19-22, 26-28, 32-34. Accordingly, Knowles clearly teaches away from using flexural/dispersive bending waves in touch-screen technology.

In contrast to Knowles which *suppresses* flexural/dispersive bending waves, the present invention *encourages* flexural waves and, therefore, claim 1 (as amended) recites “applying a correction to convert the measured [dispersive] bending wave signal . . .” Further, as a result of the dispersive nature of these waves, the time of flight analysis set forth in Knowles inapplicable. Therefore, as Knowles explicitly teaches suppressing dispersive waves, it fails to teach or suggest “applying a correction to convert the measured [dispersive] bending wave signal to a propagation signal from a non-dispersive wave source.”

As Knowles fails to disclose each limitation of claim 1, it can not anticipate the claim under § 102(b) and, therefore, the rejection thereof should be withdrawn. Moreover, as each of claims 7-9 and 20 depends from claim 1, each of these claims is also allowable over Knowles, without regard to the other patentable limitations recited therein. As a result, Applicant earnestly solicits a withdrawal of the rejection of claims 1, 7-9, and 20 under § 102(b).

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<sup>1</sup> “Anti-symmetric Lamb wave” is a generic term for a wave that can exist in a plate; flexural waves are a subset of this class occurring when the plate thickness is small compared to the excitation wavelength.

**ii. Claims 22-26, 39-41, and 50**

Like claim 1, independent method claim 22 has been amended to recite “applying a correction to convert the measured bending wave signal to a propagation signal from a non-dispersive wave source.” Accordingly, the same arguments previously set forth with respect to claim 1 (and the inapplicability of Knowles thereto) are fully applicable here.

As Knowles teaches suppressing dispersive bending waves, it fails to teach or suggest converting them as recited in claim 22 and, therefore, Knowles can not be used to reject the claim under § 102(b). Moreover, as each of claims 23-26, 39-41 and 50 depends from claim 22, each of these claims is also allowable over Knowles, without regard to the other patentable limitations recited therein. As a result, Applicant earnestly solicits a withdrawal of the rejection of claims 22-26, 39-41 and 50 under § 102(b).

**iii. Claims 52-55**

Like claims 1 and 22, independent method claim 52 has been amended to recite “applying a correction to convert the measured bending wave signal to a propagation signal from a non-dispersive wave source.” Accordingly, the same arguments previously set forth with respect to claims 1 and 22 (and the inapplicability of Knowles thereto) are fully applicable here.

As Knowles teaches suppressing dispersive bending waves, it fails to teach or suggest converting them as recited in claim 52 and, therefore, Knowles can not be used to reject the claim under § 102(b). Moreover, as each of claims 53-55 depends from claim 52, each of these claims is also allowable over Knowles, without regard to the other patentable limitations recited therein. As a result, Applicant earnestly solicits a withdrawal of the rejection of claims 52-55 under § 102(b).

**iv. Claims 62, 66, and 69**

Like claims 1, 22, and 52, independent apparatus claim 62 has been amended to recite “applying a correction to convert the measured bending wave signal to a propagation signal from a non-dispersive wave source.” Accordingly, the same arguments previously set forth with respect to claims 1, 22, and 52 (and the inapplicability of Knowles thereto) are fully applicable here.

As Knowles teaches suppressing dispersive bending waves, it fails to teach or suggest converting them as recited in claim 62 and, therefore, Knowles can not be used to reject the

claim under § 102(b). Moreover, as each of claims 66 and 69 depends from claim 62, each of these claims is also allowable over Knowles, without regard to the other patentable limitations recited therein. As a result of the foregoing, Applicant earnestly solicits a withdrawal of the rejection of claims 62, 66, and 69 under § 102(b).

**v. Claims 93-95, and 97**

Like claims 1, 22, 52, and 62 independent apparatus claim 93 has been amended to recite “applying a correction to convert the measured bending wave signal to a propagation signal from a non-dispersive wave source.” Accordingly, the same arguments previously set forth with respect to claims 1, 22, 52, and 62 (and the inapplicability of Knowles thereto) are fully applicable here.

As Knowles teaches suppressing dispersive bending waves, it fails to teach or suggest converting them as recited in claim 93 and, therefore, Knowles can not be used to reject the claim under § 102(b). Moreover, as each of claims 94, 95, and 97 depends from claim 93, each of these claims is also allowable over Knowles, without regard to the other patentable limitations recited therein. As a result, Applicant earnestly solicits a withdrawal of the rejection of claims 93-95, and 97 under § 102(b) for anticipation by Knowles.

**b. Rejection of Claims 93-95 and 97 under 35 U.S.C. § 102(b)**

The Examiner rejected claims 93-95 and 97 under 35 U.S.C. § 102(b) as being anticipated by WO 97/09842, which the Examiner referred to as “Hill.” However, although the inventor of the present application is Nicholas P.R. HILL, none of the inventors of WO 97/09842 is named “Hill.” The first named inventor of WO 97/09842 is “Azima.” However, “Azima” is the same name given to the reference applied in section 2(k), *infra*. Therefore, to avoid confusion, WO 97/09842 will be referred to as “Colloms” (the second named inventor).

Applicant traverses this rejection for the followings reasons. First, the Examiner cites to Fig. 1 and p. 41, lines 7-30 to support his contention that Colloms teaches the following limitations of claim 93: (a) “a contact made on a surface of the member [capable of supporting bending wave vibration]” and (b) “to probe for information relating to [the] contact.” Neither of these contentions is defensible. There is nothing in Colloms that somehow relates to an “active contact sensitive device” as claimed herein, let alone mention of physical contact (*e.g.*, touching) the panel member. Fig. 22 shows a device that acts either

as a loudspeaker or a microphone; Fig. 23 shows a microphone. There is simply no need disclosed in Colloms to probe for panel contact information.

Second, irrespective of the aforementioned arguments, Colloms fails to teach or suggest the following limitation added to claim 93: “applying a correction to convert the measured bending wave signal to a propagation signal from a non-dispersive wave source.”

Accordingly, for all of the aforementioned reasons, Colloms fails to teach or suggest each of the limitations of claim 93 and, therefore, can not be used to reject the claim under § 102(b). Moreover, as each of claims 94, 95, and 97 depends from claim 93, each of these claims is also allowable over Colloms, without regard to the other patentable limitations recited therein. As a result, Applicant earnestly solicits a withdrawal of the rejection of claims 93-95, and 97 under § 102(b) for anticipation by Colloms.

**c. Rejection of Claims 2, 3, 6, 21, 34, 35, 38, 51, 67, and 85 under 35 U.S.C. § 103(a)**

The Examiner rejected claims 2, 3, 6, 21, 34, 35, 38, 51, 67, and 85 under 35 U.S.C. § 103(a) as being unpatentable over Knowles in view of U.S. Patent No. 6,091,406 (“Kambara”). As claims 2 and 34 have been cancelled without prejudice or disclaimer, this rejection will be addressed with respect to claims 3, 6, 21, 35, 38, 51, 67, and 85.

**i. Claims 3, 6, and 21**

With respect to claims 3 and 6, the Examiner acknowledges that there is no teaching of applying a correction to compensate for dispersion in Knowles and relies on Kambara to provide this feature. For the following reasons, however, Kambara fails to cure this deficiency of Knowles and, therefore, Applicant respectfully traverses the rejection.

Kambara describes a touch sensor with a similar topology to many acoustic wave prior art devices; there is a wave source, a reflecting array to spread the waves over the surface of a plate, and a second array to collect the waves after having been spread over the surface. However, unlike many known devices, the actuators/sensors in Kambara are on the underside of the plate so as to drive a bulk wave into the plate; the bulk wave is converted into a useful wave, such as a surface acoustic wave (Rayleigh wave).

Kambara identifies that symmetric Lamb waves (*i.e.*, longitudinal compression waves) and transverse waves (*i.e.*, shear waves) are among waves suitable for the method described therein. *See* col. 7, lines 5-11; col. 10, lines 37-68. Kambara does not, however, identify anti-symmetric Lamb waves (*i.e.*, flexural waves) as being among those suitable



waves. In addition, although the word “disperse” is frequently used, it is used in the context of describing how the *waves* spread over the surface. In contrast, in the present invention, “dispersive” is used in the context of a frequency dependent velocity that causes the shape of *a particular wave* to vary over time. As a result, the method described in Kambara relies on the “time of flight” of Knowles and is, therefore, inapplicable to the flexural/dispersive waves contemplated by the present invention.

The nature of the Kambara substrate which supports the waves is critical in determining the effectiveness of the device and, in particular, the substrate may be chosen to filter out parasitic plate waves. *See* col. 11, lines 30-55. Further, the measured signal is filtered to remove parasitic acoustic paths having too short or too long an acoustic delay. *See* col. 14, lines 5 - 15. As previously discussed, the waves used are unlikely to be dispersive and, therefore, would fail to satisfy the limitations of claim 1. Nevertheless, even if the methods taught (including physically using a grating 5a', 5b' 8a', 8b' to yield a Fourier transform of the waves (*see* Fig. 4, col. 9, line 43- col. 10, line 36)) are considered to correct for the dispersive nature of the waves used, there is no teaching of correcting the measured *dispersive* bending wave signal to that of a *non-dispersive* signal as recited in claim 1.

Accordingly, for all of the aforementioned reasons, the combination of Knowles and Kambara fails to teach or suggest the following limitation of claim 1: “applying a correction to convert the measured bending wave signal to a propagation signal from a non-dispersive wave source.” As a result, the combination of Knowles and Kambara can not be used to reject claim 1, or claims dependent thereon, under § 103(a). Therefore, as claims 3 and 6 depend from claim 1, Applicant earnestly solicits a withdrawal of the rejection of these dependent claims under § 103(a).

**ii. Claims 35, 38, and 51**

As previously discussed in § 2(c)(i), the combination of Knowles and Kambara fails to teach or suggest the following limitation of claims 1, 3, 6, and 21: “applying a correction to convert the measured bending wave signal to a propagation signal from a non-dispersive wave source.” As claim 22 recites the same limitation, the same arguments previously set forth with respect to claims 1, 3, 6, and 21 are fully applicable here, *i.e.*, the combination of Knowles and Kambara also fails to teach or suggest each limitation of claim 22 and any claim dependent thereon, including claims 35, 38, and 51. Accordingly, as the combination of

Knowles and Kambara fails to teach or suggest each of the limitations of claims 35, 38, and 51 (through their dependency on claim 22), the combination can not be used to reject these dependent claims under § 103(a) and, therefore, the rejection thereof should be withdrawn.

**iii. Claims 67 and 85**

As previously discussed in §§ 2(c)(i) and (ii), the combination of Knowles and Kambara fails to teach or suggest the following limitation of independent claims 1 and 22: “applying a correction to convert the measured bending wave signal to a propagation signal from a non-dispersive wave source.” As claim 62 recites the same limitation, the same arguments previously set forth with respect to claims 1, 3, 6, 21, 22, 35, 38, and 51 are fully applicable here, *i.e.*, the combination of Knowles and Kambara also fails to teach or suggest each limitation of claim 62 and any claim dependent thereon, including claims 67 and 85. Accordingly, as the combination of Knowles and Kambara fails to teach or suggest each of the limitations of claims 67 and 85 (through their dependency on claim 62), the combination can not be used to reject these dependent claims under § 103(a) and, therefore, the rejection thereof should be withdrawn.

**d. Rejection of Claims 4 and 36 under 35 U.S.C. § 103(a)**

The Examiner rejected claims 4 and 36 under 35 U.S.C. § 103(a) as being unpatentable over Knowles and Kambara in view of U.S. Patent No. 5,856,820 (“Wiegers”). As previously discussed, independent claims 1 and 22 recite the following limitation which is neither taught nor suggested by the combination of Knowles and Kambara: “applying a correction to convert the measured bending wave signal to a propagation signal from a non-dispersive wave source.” As claims 4 and 36 depend, respectively, from claims 1 and 22, this limitation is also recited by these dependent claims. As a result, the combination of Knowles and Kambara also fails to teach or suggest this limitation with respect to these dependent claims. Wiegers fails to cure this deficiency. Accordingly, the broader combination of Knowles, Kambara, and Wiegers fails to teach or suggest each of the limitations of claims 4 and 36.

In addition, the Examiner relies on Weigers for a teaching of the following limitation recited in claims 4 and 36: “wherein the dispersion relation is modeled by using the bending wave equation in combination with known physical parameters of the material of the member.” However, the passage cited (col. 2, lines 63-66) does not teach modeling a

“dispersion relation.” Further, the cited passage merely states that the evanescent wave (as calculated using the bending wave equation) will be attenuated by the backing layer, *i.e.*, the backing layer is not taken into account as a variable in the bending wave equation as recited in claims 4 and 36. Accordingly, for this additional reason, the combination of Knowles, Kambara, and Weigers fails to teach or suggest each of the limitations of claims 4 and 36.

Therefore, for all of the aforementioned reasons, as the combination of Knowles, Kambara, and Wiegers fails to teach or suggest each of the limitations of claims 4 and 36, this combination can not be used to reject the claims under § 103(a). Accordingly, Applicant earnestly solicits a withdrawal of the rejection of claims 4 and 36 under § 103(a).

**e. Rejection of Claims 5 and 37 under 35 U.S.C. § 103(a)**

The Examiner rejected claims 5 and 37 under 35 U.S.C. § 103(a) as being unpatentable over Knowles and Kambara in view of U.S. Patent No. 6,246,638 (“Zook”). As previously discussed, independent claims 1 and 22 recite the following limitation which is neither taught nor suggested by the combination of Knowles and Kambara: “applying a correction to convert the measured bending wave signal to a propagation signal from a non-dispersive wave source.” As claims 5 and 37 depend, respectively, from claims 1 and 22, this limitation is also recited by these dependent claims. As a result, the combination of Knowles and Kambara also fails to teach or suggest this limitation with respect to these dependent claims. Zook fails to cure this deficiency. Accordingly, the broader combination of Knowles, Kambara, and Zook fails to teach or suggest each of the limitations of claims 5 and 37.

In addition, the Examiner cites to a passage in Zook (col. 5, lines 57-60) which teaches measuring vibration amplitude using a vibrometer. As this passage measures “amplitude,” it does not teach measuring the “dispersion relation,” as recited in claims 5 and 37. Accordingly, for this additional reason, the combination of Knowles, Kambara, and Zook fails to teach or suggest each of the limitations of claims 5 and 7.

Finally, although Zook addresses laser frequency modulation (*see, e.g.* Abstract; col. 2, lines 37-43), the Examiner has failed to provide any motivation for combining this reference (which involves detecting undesirable vibrations in rotating machinery) with Knowles and/or Kambara (which involve touch-screen technology).

Therefore, for all of the aforementioned reasons, as the broader combination of Knowles, Kambara, and Zook fails to teach or suggest each of the limitations of claims 5 and

37, this broader combination can not be used to reject the claims under § 103(a). Accordingly, Applicant earnestly solicits a withdrawal of the rejection of claims 5 and 37 under § 103(a).

**f. Rejection of Claims 12-14, 44-46, 58, and 59 under 35 U.S.C. § 103(a)**

The Examiner rejected claims 12-14, 44-46, 58, and 59 under 35 U.S.C. § 103(a) as being unpatentable over Knowles in view of U.S. Patent No. 5,638,093 (“Takahashi”). As previously discussed, independent claims 1, 22, and 52 recite the following limitation which is neither taught nor suggested by the Knowles: “applying a correction to convert the measured bending wave signal to a propagation signal from a non-dispersive wave source.” As claims 12-14 depend from claim 1, as claims 44-46 depend from claim 22, and as claims 58 and 59 depend from claim 52, this limitation is also recited by these dependent claims. As a result, Knowles also fails to teach or suggest this limitation with respect to these dependent claims.

Although Takahashi teaches amplifying, rectifying, and digitizing a signal (*see* col. 6, lines 22-30), it does not teach that the conversion is “to a propagation signal from a non-dispersive wave source.” Accordingly, Takahashi fails to cure the deficiencies of Knowles. Therefore, as the combination of Knowles and Takahashi fails to teach or suggest each of the limitations of claims 12-14, 44-46, 58, and 59, it can not be used to reject the claims under § 103(a). As a result, Applicant respectfully requests a withdrawal of the rejection of claims 12-14, 44-46, 58, and 59 under § 103(a).

**g. Rejection of Claims 15 and 47 under 35 U.S.C. § 103(a)**

The Examiner rejected claims 15 and 47 under 35 U.S.C. § 103(a) as being unpatentable over Knowles in view of U.S. Patent No. 6,160,757 (“Tager”). For the following reasons, Applicant respectfully traverses this rejection.

As previously discussed, independent claims 1 and 22 recite the following limitation which is neither taught nor suggested by the Knowles: “applying a correction to convert the measured bending wave signal to a propagation signal from a non-dispersive wave source.” As claims 15 and 47 depend, respectively, from claims 1 and 22, this limitation is also recited by these dependent claims and, therefore, Knowles also fails to teach or suggest this limitation with respect to these dependent claims. Tager fails to cure this deficiency. Accordingly, as the combination of Knowles and Tager fails to teach or suggest each of the

limitations of claims 15 and 47, it can not be used to reject the claims under § 103(a). As a result, Applicant respectfully requests a withdrawal of the rejection of claims 15 and 47 under § 103(a).

**h. Rejection of Claims 16 and 48 under 35 U.S.C. § 103(a)**

The Examiner rejected claims 16 and 48 under 35 U.S.C. § 103(a) as being unpatentable over Knowles and Tager in view of U.S. Patent No. 6,400,996 (“Hoffberg”). For the following reasons, Applicant respectfully traverses this rejection.

As previously discussed, independent claims 1 and 22 recite the following limitation which is neither taught nor suggested by the Knowles: “applying a correction to convert the measured bending wave signal to a propagation signal from a non-dispersive wave source.” As claims 16 and 48 depend, respectively, from claims 1 and 22, this limitation is also recited by these dependent claims and, therefore, Knowles also fails to teach or suggest this limitation with respect to these dependent claims. Hoffberg fails to cure this deficiency. Accordingly, as the combination of Knowles and Hoffberg fails to teach or suggest each of the limitations of claims 16 and 48, it can not be used to reject the claims under § 103(a). As a result, Applicant respectfully requests a withdrawal of the rejection of claims 16 and 48 under § 103(a).

**i. Rejection of Claim 18 under 35 U.S.C. § 103(a)**

The Examiner rejected claim 18 under 35 U.S.C. § 103(a) as being unpatentable over Knowles in view of U.S. Patent No. 5,877,458 (“Flowers”). The Examiner rejected this claim “over Knowles as aforementioned in claim 1 in view of Flowers (US Patent No. 6,160,757).” However, as U.S. Patent No. 6,160,757 is the Tager reference discussed in § 2(g), Applicant assumes the Examiner meant to say “US Patent No. 5,877,458” which has Mark Flowers as the first named inventor. For the following reasons, Applicant respectfully traverses this rejection.

As previously discussed, independent claim 1 recites the following limitation which is neither taught nor suggested by the Knowles: “applying a correction to convert the measured bending wave signal to a propagation signal from a non-dispersive wave source.” As claim 18 depends from claim 1, this limitation is also recited by this dependent claim and, therefore, Knowles also fails to teach or suggest this limitation with respect to this dependent claim. Flowers fails to cure this deficiency. Accordingly, as the combination of Knowles and

Flowers fails to teach or suggest each of the limitations of claim 18, it can not be used to reject the claim under § 103(a). As a result, Applicant respectfully requests a withdrawal of the rejection of claim 18 under § 103(a).

**j. Rejection of Claims 19, 33, 49, and 60 under 35 U.S.C. § 103(a)**

The Examiner rejected claims 19, 33, 49, and 60 under 35 U.S.C. § 103(a) as being unpatentable over Knowles in view of Kent. For the reasons hereafter set forth in detail, Applicant respectfully traverses this rejection

As previously mentioned, Knowles fails to teach or suggest the following limitation recited in claims 1, 22, and 52: “applying a correction to convert the measured bending wave signal to a propagation signal from a non-dispersive wave source.” As claim 19 depends from claim 1, as claims 33 and 49 depend from claim 22, and as claim 60 depends from claim 52, this limitation is also recited by these dependent claims and, therefore, Knowles also fails to teach or suggest this limitation with respect to these dependent claims. Kent fails to cure this deficiency.

Kent teaches a touch-screen which uses a variety of waveforms (*e.g.*, Rayleigh waves, Love waves, plate waves including symmetric Lamb wave, anti-symmetric Lamb waves, and zeroth order horizontally polarized shear (ZOHPs) waves) having varying path geometries, frequencies, and amplitudes to detect contact on the screen; essentially Kent uses the “don’t put all your eggs in one basket theory.” *See, e.g.*, col. 1, lines 18-21; col. 7, lines 5-37.

Kent uses multiple waveforms (and variations thereof) because Kent sees each waveform as having certain positive characteristics and certain drawbacks. For example, Kent asserts that although Lamb waves may respond to water droplets better than Rayleigh waves because Lamb waves are less sensitive than Rayleigh waves, such reduced sensitivity can be problematic in other contexts. Moreover, Kent describes Lamb waves as being more susceptible to electromagnetic interference (and, therefore, require an “expensive” controller circuit). *See* col. 7, line 64 – col. 8, line 3. Further, to increase the sensitivity of substrates employing Lamb waves, the thickness of the substrates must be minimized thereby rendering the substrate “fragile.” *Id.* at col. 8, lines 8-13. By using multiple waveforms (and varieties thereof), Kent improves the likelihood of positive contact recognition in a variety of conditions. *See* col. 8, lines 43-56.

Although Kent teaches analyzing various waveforms and converting them to electrical signals (*see, e.g.*, col. 5, lines 45-53; col. 15, lines 27-32; col. 31, lines 12-15; col. 33, lines 16-36), Kent does not teach or suggest intentionally converting a dispersive waveform into a signal of a non-dispersive wave.<sup>2</sup> Accordingly, Kent fails to cure the deficiencies of Knowles because it fails to teach or suggest: “applying a correction to convert the measured bending wave signal to a propagation signal from a non-dispersive wave source.”

Accordingly, as the combination of Knowles and Kent fails to teach or suggest each of the limitations of claims 19, 33, 49, and 60, it can not be used to reject the claims under § 103(a). As a result, Applicant respectfully requests a withdrawal of the rejection of claims 19, 33, 49, and 60 under § 103(a).

**k. Rejection of Claim 31 under 35 U.S.C. § 103(a)**

The Examiner rejected claim 31 under 35 U.S.C. § 103(a) as being unpatentable over Knowles in view of Azima. For the following reasons, Applicant respectfully traverses this rejection.

As previously discussed, independent claim 22 recites the following limitation which is neither taught nor suggested by the Knowles: “applying a correction to convert the measured bending wave signal to a propagation signal from a non-dispersive wave source.” As claim 31 depends from claim 22, this limitation is also recited by this dependent claim and, therefore, Knowles also fails to teach or suggest this limitation with respect to this dependent claim. Azima fails to cure this deficiency. Accordingly, as the combination of Knowles and Azima fails to teach or suggest each of the limitations of claim 31, it can not be used to reject the claim under § 103(a). As a result, Applicant respectfully requests a withdrawal of the rejection of claim 31 under § 103(a).

**l. Rejection of Claim 32 under 35 U.S.C. § 103(a)**

The Examiner rejected claim 32 under 35 U.S.C. § 103(a) as being unpatentable over Knowles and Azima in view of Kent. As previously mentioned, Applicant notes that this rejection is internally inconsistent with the rejection of claim 32 under 35 U.S.C. § 102(b) as being anticipated by Knowles (discussed in § 2(a)). However, as previously discussed, this

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<sup>2</sup> Kent does teach that a waveform can change modes at a boundary. However, Kent describes such an occurrence as being “parasitic” and, therefore, undesirable. *See* col. 47, lines 43-66.

rejection will be treated as been having made under § 103(a). For the following reasons, Applicant respectfully traverses this rejection.

As previously discussed, independent claim 22 recites the following limitation which is neither taught nor suggested by the combination of Knowles and Azima: “applying a correction to convert the measured bending wave signal to a propagation signal from a non-dispersive wave source.” As claim 32 depends from claim 22, this limitation is also recited by this dependent claim and, therefore, the combination of Knowles and Azima also fails to teach or suggest this limitation with respect to this dependent claim. For the reasons previously set forth in § 2(j), Kent fails to cure this deficiency. Accordingly, as the combination of Knowles, Azima, and Kent fails to teach or suggest each of the limitations of claim 32, it can not be used to reject the claim under § 103(a). As a result, Applicant respectfully requests a withdrawal of the rejection of claim 32 under § 103(a).

**m. Rejection of Claims 68, 70, 86, and 88 under 35 U.S.C. § 103(a)**

The Examiner rejected claims 68, 70, 86, and 88 under 35 U.S.C. § 103(a) as being unpatentable over Knowles in view of U.S. Patent No. 4,389,711 (“Hotta”). Preliminarily, as claims 86 and 88 have been amended to depend from new claim 98, the rejection thereof is now moot and, therefore, this rejection will be addressed with respect to claims 68 and 70. For the following reasons, Applicant respectfully traverses this rejection.

As previously discussed, independent claim 62 recites the following limitation which is neither taught nor suggested by the Knowles: “applying a correction to convert the measured bending wave signal to a propagation signal from a non-dispersive wave source.” As claims 68 and 70 depend from claim 62, this limitation is also recited by these dependent claims and, therefore, Knowles also fails to teach or suggest this limitation with respect to these dependent claims. Hotta fails to cure this deficiency. Accordingly, as the combination of Knowles and Hotta fails to teach or suggest each of the limitations of claims 68 and 70, it can not be used to reject the claims under § 103(a). As a result, Applicant respectfully requests a withdrawal of the rejection of claims 68 and 70 under § 103(a).

**n. Rejection of Claims 73, 74, 91, and 92 under 35 U.S.C. § 103(a)**

The Examiner rejected claims 73, 74, 91, and 92 under 35 U.S.C. § 103(a) as being unpatentable over Knowles in view of U.S. Patent No. 6,335,725 (“Koh”). For the following reasons, Applicant respectfully traverses this rejection.



As previously discussed, independent claim 62 recites the following limitation which is neither taught nor suggested by the Knowles: “applying a correction to convert the measured bending wave signal to a propagation signal from a non-dispersive wave source.” As claims 73, 74, 91, and 92 depend from claim 62, this limitation is also recited by these dependent claims and, therefore, Knowles also fails to teach or suggest this limitation with respect to these dependent claims. Koh fails to cure this deficiency. Accordingly, as the combination of Knowles and Koh fails to teach or suggest each of the limitations of claims 73, 74, 91, and 92, it can not be used to reject the claims under § 103(a). As a result, Applicant respectfully requests a withdrawal of the rejection of claims 73, 74, 91, and 92 under § 103(a).

**o. Rejection of Claims 72 and 90 under 35 U.S.C. § 103(a)**

The Examiner rejected claims 72 and 90 under 35 U.S.C. § 103(a) as being unpatentable over Knowles in view of U.S. Patent No. 6,072,475 (“van Ketwich”). Preliminarily, as claim 90 has been amended to depend from new claim 98, the rejection thereof is now moot and, therefore, this rejection will be addressed with respect to claim 72. For the following reasons, Applicant respectfully traverses this rejection.

As previously discussed, independent claim 62 recites the following limitation which is neither taught nor suggested by the Knowles: “applying a correction to convert the measured bending wave signal to a propagation signal from a non-dispersive wave source.” As claim 72 depends from claim 62, this limitation is also recited by this dependent claim and, therefore, Knowles also fails to teach or suggest this limitation with respect to this dependent claim. Van Ketwich fails to cure this deficiency. Accordingly, as the combination of Knowles and van Ketwich fails to teach or suggest each of the limitations of claim 72, it can not be used to reject the claim under § 103(a). As a result, Applicant respectfully requests a withdrawal of the rejection of claim 72 under § 103(a).

**p. Rejection of Claim 96 under 35 U.S.C. § 103(a)**

The Examiner rejected claim 96 under 35 U.S.C. § 103(a) as being unpatentable over Colloms in view of U.S. Patent No. 4,246,439 (“Romein”). For the reasons hereafter set forth, Applicant respectfully traverses this rejection.

As previously mentioned, Colloms fails to teach or suggest the following limitations of claim 93, *i.e.*, the claim from which claim 96 depends: (a) “a contact made on a surface of

the member [capable of supporting bending wave vibration]”; (b) “to probe for information relating to [the] contact”; and (c) “applying a correction to convert the measured bending wave signal to a propagation signal from a non-dispersive wave source.” As claim 96 depends from claim 93, these limitations are also recited by this dependent claim and, therefore, Colloms also fails to teach or suggest these limitations with respect to this dependent claim. Although the Examiner relies on Romein to cure the deficiencies of Colloms, Romein fails in this regard.

Although Romein teaches contacting a stylus 1 on a writing table and using sound sources 3, 4 in conjunction with microphones 6, 7 to determine the location of the stylus (*see* col. 2, line 18 – col. 3, line 31), Romein does not teach or suggest: “applying a correction to convert the measured bending wave signal to a propagation signal from a non-dispersive wave source.” Accordingly, as the combination of Colloms and Romein fails to teach or suggest each of the limitations of claim 96, it can not be used to reject the claim under § 103(a). As a result, Applicant respectfully requests a withdrawal of the rejection of claim 96 under § 103(a).

### **3. New Claims 98-100**

#### **a. New Claim 98**

New independent claim 98 has been added and previous claims 76-79, 81, 84-88, and 90-92 have been amended to depend therefrom. Like independent claims 1, 22, 52, 62, and 93, new claim 98 recites “applying a correction to convert the measured bending wave signal to a propagation signal from a non-dispersive wave source.” Accordingly, new claim 98 and its dependent claims are also allowable over the art of record.

#### **b. New Claims 99-100**

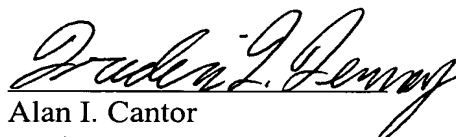
New claim 99 recites: “contacting the member at a discrete location to generate bending wave vibration in the member *by frictional movement of the contact.*” Support for this recitation is provided at page 5 of the instant application. As no previous claim recited the use of frictional movement of a contact to generate bending waves, new claim 99, which is not limited by applying a dispersion correction, has been added to capture this subject matter.

**CONCLUSION**

For the previously stated reasons, claims 1, 3-16, 18-33, 35-62, 64-70, 72-74, 76-79, 81, 82, 84-88, 90-100 are now in condition for allowance. Favorable action is earnestly solicited and a Notice of Allowance at an early date is respectfully requested. The Examiner is invited to contact the undersigned if such communication would expedite the prosecution of the application.

Respectfully submitted,

January 13, 2003  
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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE CLAIMS:

1. (Amended) A method of determining information relating to a contact on a passive contact sensitive device comprising the steps of:  
providing a member capable of supporting bending wave vibration,  
contacting the member at a discrete location to [produce a change in] generate  
bending wave vibration in the member,  
measuring the [changed] bending wave vibration in the member to determine a  
measured bending wave signal, and  
processing the measured bending wave signal to calculate information relating to the  
contact including applying a correction to convert the measured bending wave  
signal to a propagation signal from a non-dispersive wave source.
3. (Amended) A method according to claim [2,] 1, wherein the correction applied is  
based on a dispersion relation of the material of the member.
4. (Amended) A method according to claim 3, wherein the dispersion relation is  
[modelled] modeled by using the bending wave equation in combination with known physical  
parameters of the material of the member.

22. (Amended) A method of determining information relating to a contact on [a] an active contact sensitive device comprising the steps of:

providing a member capable of supporting bending wave vibration,  
generating bending wave vibration in the member to probe for information relating to a contact,  
contacting the member at a discrete location to produce a change in the generated bending wave vibration in the member,  
measuring the changed bending wave vibration in the member to determine a measured bending wave signal, and  
processing the measured bending wave signal to calculate information relating to the contact, including applying a correction to convert the measured bending wave signal to a propagation signal from a non-dispersive wave source.

35. (Amended) A method according to claim [34,] 22, wherein the correction applied is based on a dispersion relation of the material of the member.

36. (Amended) A method according to claim 35, wherein the dispersion relation is [modelled] modeled by using the bending wave equation in combination with known physical parameters of the material of the member.

52. (Amended) A method of determining information relating to a contact on [a] an active contact sensitive device comprising the steps of:

providing a panel-form member capable of supporting bending wave vibration,  
generating bending wave vibration in the member from one location on the member to probe for information relating to a contact,  
contacting the member at a discrete location to produce a change in the generated bending wave vibration in the member,  
measuring the changed bending wave vibration in the member at two locations on the member to determine a measured bending wave signal, and

processing the measured bending wave signal to calculate information relating to the contact including applying a correction to convert the measured bending wave signal to a propagation signal from a non-dispersive wave source.

62. (Amended) A passive contact sensitive device comprising:  
a member capable of supporting bending wave vibration,  
at least one sensor coupled to the member for measuring bending wave vibration in the member, and  
a processor operatively coupled to the at least one sensor for processing information relating to the contact made on a surface on the member from the [change in] generation of bending wave vibration in the member [produced] created by the contact and measured by the at least one sensor and for applying a correction to convert the measured bending wave signal to a propagation signal from a non-dispersive wave source.

64. (Amended) A contact sensitive device according to claim [63,] 62, wherein the member is a display screen.

76. (Amended) A contact sensitive device according to claim [75,] 98, wherein information relating to the contact is calculated by comparing the [response of] measured bending wave [vibration generated by the emitting transducer to a mechanical constraint caused by the] signal to a reference signal before contact is made.

77. (Amended) A contact sensitive device according to claim [75,] 98, wherein the emitting transducer has dual functionality and acts as the emitting transducer and the at least one sensor.

78. (Amended) A contact sensitive device according to claim [75,] 98, wherein the emitting transducer and the at least one sensor are placed with a relatively equal spacing around the periphery of the member.

79. (Amended) A contact sensitive device according to claim [75,] 98, wherein the emitting transducer and the at least one sensor are located at the same point and are coupled into orthogonal physical properties.

81. (Amended) A contact sensitive device according to claim [75,] 98, wherein the member is a display screen.

84. (Amended) A contact sensitive device according to claim [75,] 98, wherein the at least one sensor is mounted at an edge of the member.

85. (Amended) A contact sensitive device according to claim [75,] 98, wherein the at least one sensor is mounted on the member spaced from an edge of the member.

86. (Amended) A contact sensitive device according to claim [75,] 98, wherein the member is transparent.

87. (Amended) A contact sensitive device according to claim [75,] 98, wherein the member is in the form of a panel.

88. (Amended) A contact sensitive device according to claim [75,] 98, wherein the member has uniform thickness.

90. (Amended) A mobile phone comprising a contact sensitive device according to claim [75] 98.

91. (Amended) A lap-top computer comprising a contact sensitive device according to claim [75] 98.

92. (Amended) A personal data assistant comprising a contact sensitive device according to claim [75] 98.

93. (Amended) An active [A] contact sensitive device incorporating a loudspeaker, the device comprising:

a member capable of supporting bending wave vibration and forming an acoustic radiator when excited,

an exciter coupled to the member for exciting bending wave vibration in the member to probe for information relating to a contact made on a surface of the member, and to cause the member to produce an acoustic output,

at least one sensor coupled to the member for measuring bending wave vibration in the member, and

a processor operatively coupled to the at least one sensor for processing information relating to the contact from the change in bending wave vibration in the member produced by the contact and measured by the at least one sensor and for applying a correction to convert the measured bending wave signal to a propagation signal from a non-dispersive wave source.